



## WRAPPING PACKAGING MACHINE

### SUBJECT OF THE INVENTION

The present invention relates to a wrapping packaging machine for the packaging of an object, said wrapping packaging machine comprising

- a track disposed mainly around the object to be packaged,
- at least one film feed device carrying at least one wrapping film roll for wrapping a plastic film band around the object to be packaged, and
- a drive for moving the film feed device around the object to be packaged.

### PRIOR ART

Patent specification EP 0743913 B1 discloses a wrapping packaging machine for the packaging of a ring-like object. The device described in the specification comprises an openable loop-shaped track, along which a wrapping film feed device circulates to wrap a plastic film band around a ring-like object. The feed device circulating along the track is provided with an electric motor driving the feed device. The power transmission of the feed device is implemented in such manner that the electric motor drives a sprocket comprised in the feed device and engaging a toothed ring on the inner surface of the loop-shaped track. Electric power to the electric motor of the feed device is supplied via guide rails placed on one side of the loop-shaped track.

In the prior-art wrapping packaging machine disclosed in specification EP 0743913 B1, there are problems due to the fact that the electric conductors are placed in the openable loop-shaped track. The structure of the conductor rails of the openable track has to be made very accurate e.g. by machining to ensure that the collectors will work properly without disturbances. Such a structure is very expensive. Further, the toothed ring on the inner surface of the loop-shaped track is also difficult and expensive to manufacture. The joints of the toothed ring involve additional problems, and so do the joints of the conductor rails.

### OBJECT OF THE INVENTION

The object of the present invention is to achieve a wrapping packaging machine that does not have the above-described drawbacks.

### FEATURES OF THE INVENTION

The wrapping packaging machine of the invention is characterized in that

- the drive of the wrapping packaging machine comprises

- at least one elongated body, preferably a flexible rod, band, chain or equivalent,
  - at least one drive element, such as a drive wheel, an endless band or equivalent for moving the elongated body along the track, and
  - and that the wrapping packaging machine comprises at least one film feed device,
- 5 connected to the elongated body either directly or via at least one connecting element, for moving it around the object to be packaged.

#### EMBODIMENTS OF THE DEVICE OF THE INVENTION

- An embodiment of the wrapping packaging machine of the invention is characterized in
- 10 - that it comprises two or more film feed devices connected to the elongated body on the track of the wrapping packaging machine
- that the wrapping film rolls of the film feed devices comprise wrapping film rolls containing similar or dissimilar plastic film bands.

- 15 A second preferred embodiment of the wrapping packaging machine of the invention is characterized in that the track of the wrapping packaging machine is of a loop-shaped, preferably circular or oval form or a rectangular track with rounded corners.

- A third preferred embodiment of the wrapping packaging machine of the invention is
- 20 characterized in that the plane passing through the track of the wrapping packaging machine is preferably vertical or horizontal.

- A fourth preferred embodiment of the wrapping packaging machine of the invention is characterized in that the elongated body on the track is made of flexible material, such as
- 25 plastic or rubber, adapting to the shape of the track.

- A fifth preferred embodiment of the wrapping packaging machine of the invention is characterized in that the drive wheel in the track is a friction wheel for moving the elongated
- body on the track by friction.

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- A sixth preferred embodiment of the wrapping packaging machine of the invention is characterized in that the elongated body on the track is a chain adaptable to the shape of the track.

- 35 A seventh preferred embodiment of the wrapping packaging machine of the invention is characterized in that
- the drive wheel in the track is a toothed wheel,

- and that the elongated body on the track is provided with a toothing corresponding to the teeth of the toothed wheel and engaging the toothed wheel.

5 An eighth preferred embodiment of the wrapping packaging machine of the invention is characterized in that

- the loop-shaped track of the wrapping packaging machine can be opened to allow the track to be placed so that it runs through a ring-shaped object to be packaged,
- that the elongated body can be moved on the loop-shaped track to wrap a plastic film band around the ring-shaped object.

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A ninth preferred embodiment of the wrapping packaging machine of the invention is characterized in that the openable track having the shape of a closed loop of the wrapping packaging machine has been formed from two parts, at least one of which can be moved sideways perpendicularly to the plane of the track.

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A tenth preferred embodiment of the wrapping packaging machine of the invention is characterized in that

- the openable track having the shape of a closed loop of the wrapping packaging machine has been formed from two parts with a joint between them,
- 20 - and that at least one of the two parts of the track can be turned sideways about the joint so that the planes passing through the track parts form an acute angle between themselves.

25 An eleventh preferred embodiment of the wrapping packaging machine of the invention is characterized in that the wrapping packaging machine comprises means for removing the elongated body from the loop-shaped track and/or for feeding the elongated body onto the loop-shaped track when at least one of the track parts has been moved or turned aside.

30 A twelfth preferred embodiment of the wrapping packaging machine of the invention is characterized in that the wrapping packaging machine comprises two tracks, of which a first track carries the elongated body while a second track carries at least one carriage provided with at least one film feed device.

35 A further preferred embodiment of the wrapping packaging machine of the invention is characterized in that

- the first, outer track of the wrapping packaging machine carries the elongated body, which is supported by bearing rollers, while the second, inner track consisting of a guide rail supports the carriage of the film feed device,
- and that the elongated body and the carriage are connected together by a connecting element, such as a connecting rod.

## EXAMPLES OF EMBODIMENTS

In the following, the invention will be described with reference to examples and the attached drawings, wherein

## LIST OF FIGURES

- Fig. 1 presents a diagrammatic side view of a wrapping packaging machine according to the invention.
- Fig. 2 corresponds to Fig. 1 and presents a diagrammatic view of another wrapping packaging machine according to the invention.
- Fig. 3 corresponds to Fig. 1 and presents a diagrammatic view of a third wrapping packaging machine according to the invention.
- Fig. 4 presents a detail of the wrapping packaging machine.
- Fig. 5 presents a section taken along line V-V in Fig. 4.
- Fig. 6 corresponds to Fig. 4 and presents a detail of the wrapping packaging machine according to the second embodiment.
- Fig. 7 presents a section taken along line VII-VII in Fig. 6,
- Fig. 8 corresponds to Fig. 4 and presents a detail of the wrapping packaging machine according to the third embodiment.
- Fig. 9 presents a diagrammatic side view of a fourth wrapping packaging machine according to the invention.
- Fig. 10 is a diagrammatic illustration of the act of opening the loop-shaped track of the wrapping packaging machine of the invention.
- Fig. 11 corresponds to Fig. 10 and illustrates the act of opening the loop-shaped track of the wrapping packaging machine according to the second embodiment.
- Fig. 12 presents a perspective view of a fifth wrapping packaging machine according to the invention and its roll changing device.
- Fig. 13 corresponds to Fig. 12 and illustrates another situation in the operation of the wrapping packaging machine.
- Fig. 14 presents a diagrammatic side view of a sixth wrapping packaging machine according to the invention.
- Fig. 15 presents a section taken along line XV-XV in Fig. 14.

Fig. 16 presents a diagrammatic illustration of the act of opening of the loop-shaped track of the wrapping packaging machine according to a third embodiment.

Fig. 17 corresponds to Fig. 1 and presents a diagrammatic view of a wrapping packaging machine according to the invention in which the track is a rectangle with rounded corners.

Fig. 18 presents diagrammatic side view of a seventh wrapping packaging machine according to the invention.

Fig. 19 presents a diagrammatic side view of an eighth wrapping packaging machine according to the invention.

Fig. 20 presents a diagrammatic side view of a ninth wrapping packaging machine according to the invention.

#### DESCRIPTION OF THE FIGURES

Fig. 1 presents a diagrammatic view of a wrapping packaging machine 10 according to the invention, with an object 11 placed inside the circular track 20 of the machine. A film feed device 40 and a film roll 41 containing wrapping plastic is placed on an elongated and flexible body 30 on the track 20, said body being moved along the track by means of three drives 21a, 21b and 21c. The length of the elongated body 20 has been so fitted that, as the body is moving on along the track 20, at least one of the drives is continuously in contact with the body 30, thus ensuring that the body 30 will be moving continuously during the wrapping operation.

The drives 21a-21c are preferably electric motors, imparting rotation to the drive wheels 22a-22c either directly or via a gear system. The drive wheels 22a-22c engage the elongated body 30 e.g. by friction or by a suitable toothing. The elongated body 30 and/or the track 20 may be provided with rollers to reduce the friction between the track 20 and the body 30.

Fig. 2 presents a diagrammatic view of a second wrapping packaging machine 10 according to the invention. In this embodiment, the track 20 is of an oval form, in which case wide and low objects to be packaged can advantageously be placed inside it. Mounted at each end of the track 20 are drives 21a and 21b, each drive comprising an endless band 26. Both bands 26a and 26b engage a considerably large portion of the length of the track 20 by means of diverting pulleys 27, so that the two drives 21a and 21b are sufficient to ensure a contact between the bands and the flexible body 30 at every point of its path around the track. Placed on the flexible body 30 on the track is a film feed device 40, which comprises a plastic film roll 41 and a set of spring rollers 43.

The track 20 of the wrapping packaging machine 10 in Fig. 3 has the shape of a square with rounded corners and it has only one drive 21 and one endless band 26. However, by means of diverting pulleys 27, the band 26 can be brought into contact with the track 20 on nearly three quarters of the length of the track. In this embodiment, two film feed devices 40a and 40b are mounted on the flexible body 30 placed on the track 20.

Fig. 4 presents a detail of the wrapping packaging machine 10 according to an embodiment of the invention, showing the elongated flexible body 30 on the track 20. In this embodiment, the elongated body 30 is provided with rollers 31. The body 30 is made of e.g. flexible band material, such as plastic or rubber, or it is a chain with a film feed device 40 attached to it for feeding plastic film 42 from the film roll 41, the film being passed around the object to be packaged. The body 30 is moved along the track by means of the drives 21 and their drive wheels 22.

Fig. 5 presents a cross-section of the track 20 of the wrapping packaging machine 10 presented in Fig. 4. The elongated body 30, consisting of a flexible band, is mounted by means of rollers 31a-31b in the guide rails 20a-20b of the track. Connected to the band 30 is a film feed device 40 with a film roll 41. The band 30 is moved by the drive wheel 22 rotated by the drive 21.

Fig. 6 presents a detail of the wrapping packaging machine 10 according to another embodiment. In this case, too, the elongated body 30 is a flexible band, to which the film feed device 40 with a film roll 41 is attached. By difference from the embodiment illustrated in the preceding figures, the flexible band 30 has no rollers, but its supporting rollers 23a-23b are placed in the track 20 on either side of the band 30. The drive wheel 22 of the drive 21 simultaneously functions as a band supporting roller below the band 30.

Fig. 7 presents a cross-section of the track 20 of the wrapping packaging machine 10 in Fig. 6. The flexible band 30 is shown at the level of the drive 21, between the supporting rollers 23 of the track and the drive wheels 22 of the drive 21. Attached to the band 30 is a film feed device with a film roll 41.

In the embodiment presented in Fig. 8, as in the embodiments illustrated in the two preceding figures, the flexible band 30 provided with a film feed device 40 is between the supporting rollers 23a-23b of the track, but additionally the lower surface of the band 30 is

provided with a toothing 32. In this case, the drive wheel 22 of the drive 21 is a toothed wheel matching the toothing 32 of the band 30.

Fig. 9 presents a diagrammatic side view of a wrapping packaging machine 10 for wrapping  
5 an ring-shaped cylindrical object. Before the wrapping operation is started, the loop-shaped track 20 has to be first opened and then closed again so that the track 20 passes through the aperture 12 of the ring-shaped cylindrical object to be packaged 11. During the wrapping operation, the film feed device 40 on the closed track 20 circulates along the track 20, plastic film band 42 obtained from the plastic film roll 41 being thus wrapped around the  
10 ring-shaped object 11.

Fig. 10 presents a diagram illustrating the act of opening the loop-shaped track 20 according to the invention in such manner that one half 20a of the track remains stationary relative to the object to be packaged 11 while the opposite half 20b of the track is moved  
15 sideways. In this way, the two halves 20a and 20b of the track are moved far enough apart to provide a sufficient space near their ends. This allows the elongated body 30 of the invention to be freely fed into any one of the track halves 20a and 20b or removed from them. This is advantageous because a change of the wrapping film roll can be carried out simply by only replacing the elongated body 30 on the track 20 with another one.

20 Fig. 11 illustrates another solution for opening the loop-shaped track 20 of the wrapping packaging machine. In this figure, the two halves 20a and 20b of the track are connected together by a joint 25. In this case, the closed loop-shaped track can be opened simply by turning one 20b of the track halves aside. This is another way of moving the track halves  
25 20a and 20b far enough apart to provide a sufficient space near their ends to allow a change of the elongated body 30 and at the same time the roll.

Fig. 12 presents a diagrammatic perspective view of an embodiment of the wrapping packaging machine 10 of the invention wherein the track 20 can be divided into two parts  
30 20a and 20b. In the situation illustrated in Fig. 12, the track 20 has been placed to pass through the aperture 12 of a ring-shaped cylindrical object 11, allowing the ring-shaped object 11 to be wrapped.

In Fig. 12, the track 20 formed by the two halves 20a and 20b carries a flexible elongated  
35 body 30a and a film feed device 40a attached to it and a film roll 41a, which move along the track to wrap a ring-shaped object 11. Beside the track 20 in operation there is a third track

half 20c, which is designed to serve as a roll change unit. It comprises another elongated body 30b and a film feed device 40b attached to it, with a full film roll 41b ready for use.

When the film roll 41a used in the wrapping process in Fig. 12 runs out, the elongated body 30a is stopped on the track that it remains completely on track half 20b. After that, the track 20 is opened and track half 20b is moved sideways to a position alongside the third track half 20c. The ring-shaped object 11 can now also be replaced with another one if the wrapping of the previous object was completed.

In this situation, track halves 20b and 20c also form a continuous track as illustrated in Fig. 13, where the elongated bodies 30a and 30b can change places. In this case, the empty film roll 41a moves onto track half 20c and the full film roll correspondingly moves onto track half 20b. After that, track half 20b is again moved back into place to connect it to track half 20a, whereupon the wrapping of the object 11 can be continued as illustrated in Fig. 12. During the wrapping operation, the empty film roll 41a now remaining on track half 20c can again be replaced with a full roll, which will thus be ready for the next film roll change.

Fig. 14 presents a wrapping packaging machine 10 according to the invention in which the flexible elongated body 30 is placed on a track 20 formed by supporting rollers 23a and 23b and moved by means of drives 21a-21b and their drive wheels 22a-22c. In this embodiment, however, the film feed device 40 and the film roll 41 are not placed on the same track 20 as the elongated body 30. The film feed device 40 and the film roll 41 are placed on a carriage 51 moving along the guide rail 50 of a second separate track, supported by the supporting rollers 52a and 52b of the carriage 51. The driving device formed by the flexible elongated body 30 is connected to the carriage 51 of the film feed device 40 by a connecting piece 53, which in this embodiment is a connecting rod. However, the connecting piece 53 may also consist of e.g. a wire cable, chain or any other corresponding element.

Since the driving device 30 formed by the elongated body 30 in the solution illustrated in Fig. 14 is placed separately from the film feed device 40 and its track 50, it is also possible to provide old wrapping machines of known types with a new driving device 30 consisting of an elongated body 30 according to the invention.

The sectional view in Fig. 15 shows clearly that the track 20 of the wrapping packaging machine 10 and the second track 50 are separate from each other. The flexible elongated body 30 serving as a driving device moves along the track 20 formed by supporting rollers



23a and 23b while the film feed device 40 is mounted on a carriage 51 that moves along the track formed by the guide rail 50 and is supported by the supporting rollers 52a and 52b of the carriage 51. The driving device consisting of the elongated body 30 is connected to the carriage 51 of the film feed device 40 by a connecting rod 53, each end of the rod being  
 5 provided with a pivotal knuckle pin.

Fig. 16 presents a wrapping packaging machine 10 in which the loop-shaped track 20 connected to an upright column 24. In this case, the track 20 can be raised and lowered as required, depending on the size of the ring-shaped cylindrical object 11 to be wrapped. The  
 10 track 20 is placed in the middle of the ring-shaped cylindrical object 11 and closed. During the wrapping operation, the ring-shaped cylindrical object 11 rotated on rollers 28.

In Fig. 17, the track 20 of the wrapping packaging machine 10 is a rectangle with rounded corners. Such a shape of the track 20 is most advantageous in the wrapping of large  
 15 rectangular objects 11.

Fig. 18 presents a side view of a wrapping packaging machine 10 with a track 20 disposed in a horizontal plane. The track 20 secured to upright columns 24 so as to allow the track 20 to be raised and lowered. If the object 11 to be wrapped is of rectangular shape, then the  
 20 track is preferably a rectangle provided with corners of a rounded shape. The drives 21 connected to the track 20 move the flexible body on the track and the film roll 41 mounted on it to wrap a plastic film band 42 around the object 11.

The object to be packaged 11 is moved on the rollers 61 of a conveyor 60 into the wrapping  
 25 station of the wrapping packaging machine 10. In this situation, the wrapping track 20 is in a raised position supported by the upright columns 24, high enough to permit the object 11 to move under the track 20. By changing the height of the wrapping track 20, the sides of the object 11 can be wrapped completely.

30 Fig. 19 presents a side view of a wrapping packaging machine 10 in which a rectangular object 11 can be passed through the wrapping track 20 on the rollers 61 of a conveyor 60. In this case, too, the track 20 is preferably a rectangle with rounded corners because it is then possible to pass an object as large as possible through the track 20. Using the wrapping packaging machine 10 presented in Fig. 19, it is possible to wrap two sides and  
 35 the upper and lower faces of the object 11.

Fig. 20 presents a side view of an aggregate of devices with two wrapping packaging machines 10a and 10b installed in conjunction with the same conveyor 60 and performing wrapping operations in different planes. The machine on the left-hand side of Fig. 20 is a wrapping packaging machine 10a as presented in Fig. 18, provided with a horizontal track 20, and the machine on the right-hand side of Fig. 20 is a wrapping packaging machine 10b as presented in Fig. 19, provided with a vertical track 20. In this case, the object to be wrapped 11 is brought from left to right in Fig. 20 on the rollers 61 of the conveyor 60, first to wrapping packaging machine 10a, in which the sides of the object 11 are wrapped. After that, the object 11 is moved on the conveyor 60 to the right in Fig. 20 to the second wrapping packaging machine 10b, in which, in addition to the two sides of the object 11, its upper and lower faces are wrapped.

Each wrapping packaging machine 10a and 10b is provided with a wrapping track 20 of rectangular shape with rounded corners. The shapes of the wrapping tracks 20 and the devices 30 and 40 of the invention for transporting the film roll 41 enable objects 11 of a substantially larger size than before to be efficiently wrapped with plastic film 12.

#### ADDITIONAL REMARKS

It is obvious to the person skilled in the art that different embodiments of the invention may be varied within the scope of the claims presented below. An essential point about the invention is that any shape of the track is possible. The track may also be placed horizontally or vertically. The flexible elongated body of the invention is characterized in that it is alternately either pulled or pushed by the drive. The film feed device may be placed either on the same track directly on the elongated body or on a carriage on a separate guide rail, in which case the elongated body and the carriage are connected together by a connecting element.

## LIST OF REFERENCE NUMBERS

	10	wrapping packaging machine
	11	object to be packaged
5	12	aperture
	20	track
	21	drive
	22	drive wheel
	23	supporting roller
10	24	upright column
	25	joint
	26	endless band
	27	diverting pulley
	28	roller
15	30	elongated body
	31	roller
	32	toothing
	40	film feed device
	41	film roll
20	42	plastic film band
	43	set of spring rollers
	50	guide rail
	51	carriage
	52	roller
25	53	connecting rod
	60	conveyor
	61	roller